

REMARKS

Claims 18 and 25 have been rejected under 35 U.S.C. §112, second paragraph for failing to particularly point out and distinctly claim the invention, based on certain formal issues identified at page 2 of the Office Action. By the foregoing amendment, Claims 18 and 25 have been cancelled, because they are considered to be substantially duplicative of limitations already provided in Claims 16 and 23, respectively. Accordingly, reconsideration and withdrawal of this ground of rejection is respectfully requested.

Claims 16-20 and 23-27 have been rejected under 35 U.S.C. §102(b) as anticipated by Hinnrichs et al (U.S. Patent No. 5,479,258), while Claims 21, 22 and 28-30 have been rejected under 35 U.S.C. §103(a) as unpatentable over Hinnrichs et al. However, for the reasons set forth hereinafter, Applicants respectfully submit that all claims which remain of record in this application, including new Claims 31 and 32 (added by the foregoing amendment) distinguish over the cited references, whether considered separately or in combination.

The present invention is directed to a method and apparatus for simultaneously detecting at least two electromagnetic signals by projecting them onto a detector array, at least one of such signals containing information defining a radiation image. In general, such signal detection arrangements are known. However, in such systems, the problem arises that, when two or more electromagnetic signals are simultaneously superimposed on a common detector, it must be possible to separate the individual electromagnetic signals sufficiently to permit a clear identification of the individual signals. (See paragraph [0006].) The problem

is particularly important where one of the electromagnetic signals must be determined with a particularly high precision. Thus, for example, if one of the signals constitutes an essentially punctiform source (such as a data signal), while the other is a radiation image signal that contains a radiation intensity pattern, the projection and superimposing of both such signals onto the same sensor may cause interference and difficulty in sorting out the respective signals.

The method and apparatus of the present invention address and resolve this problem by dividing the radiation image into at least two “partial images”, each of which contains a different spatial area of the radiation image. The respective partial images are then projected onto the radiation detector at locations that are displaced from the image center of the radiation image on the radiation detector, toward the edge portion of the radiation image on the detector, such as illustrated, for example in Figure 3. In this manner, with the radiation image signals (TB1 and TB2) displaced toward the edge of the image area, the other signal 8 (for example, a data signal) is projected into an area where it is not superimposed by the radiation image signal. Thus, it becomes easy to separate the two signals, and mutual interference can be avoided. (See, for example, paragraph [0010].)

The latter features of the invention are recited in independent Claim 16, which defines a method for simultaneous detection of at least two electromagnetic signals which are projected onto a common detector, with at least one of the electromagnetic signals comprising a radiation image. As recited in Claim 16, the radiation image is divided into at least two partial images, “each partial image containing a different spatial area of said radiation image”. In addition, Claim 16 recites that the respective partial images are

projected onto the radiation detector at a location that is displaced from an image center of the radiation image to an edge portion of the radiation image on the detector. In this manner, as can be seen in Figure 3, the two electromagnetic signals, both of which are projected onto the same detector, are not superimposed and do not interfere with each other as noted previously.

Claim 23 is an apparatus claim which is similar in scope to Claim 16. In particular, it recites that each partial image contains a different spatial area of the radiation image, and that each partial image is projected onto the radiation detector at a different location that is displaced from an image center of the radiation image, to an edge portion of the radiation image.

Finally, new Claim 31 defines a method for simultaneous detection of at least first and second electromagnetic signals using a common detector, where at least the first electromagnetic signal constitutes a radiation image signal that contains a radiation intensity pattern. Claim 31 recites steps of dividing the radiation image signal into at least two “spatially defined partial images”. In addition, Claim 31 affirmatively recites steps of projecting both the second electromagnetic signal and the partial images of the first electromagnetic signal onto a radiation detector. Finally, it also provides that the radiation intensity patterns of the partial images are projected onto the radiation detector at locations that are displaced from the image center portion of the radiation detector to an edge portion, while the second electromagnetic signal is projected onto the radiation detector at a location that is within the image center portion.

Applicants respectfully submit that the latter features of the invention, summarized above, are not taught or suggested by the cited Hinnrichs et al patent, which discloses a spectrophotometer for spectral analysis of light emanating from a target. That is, Hinnrichs et al is thus directed to the spectral resolution of a single image signal which is representative of a target or targets. While it provides for dividing the incoming signal into different spectral bands, it contains no provision for dividing an incoming image signal into spatially defined partial images, as in the present invention.

As described in the Abstract of the Disclosure, in Hinnrichs et al, a diffractive lens is used to focus a received light signal onto a photodetector array. As noted in the specification at Column 5, lines 17-32, a fundamental property of diffractive lenses is that their focal length varies inversely with the illumination wavelength. Thus, by varying the distance between the lens and the photodetector array, it is possible to focus different wavelengths of light on the latter. (See Column 2, line 66 through Column 3, line 28; Column 4, lines 50-62; Column 7, lines 29-47.)

Accordingly, by continuously moving the diffractive lens and the photodetector array relative to each other, it is possible to obtain a sequence of individual “frames”, each of which corresponds to a particular wavelength of light. (See Column 4, lines 57-61.) Of course, the fact remains that, even when it is not focused on the photodetector array, light that makes up the incoming signal at other frequencies will still impinge on the detector array. In order to separate the two, the unfocused image is subtracted out leaving substantially only the signal from the focus component of the image. (Column 4, lines 61-63.)

As can be seen from the foregoing brief description, the Hinnrichs et al method and apparatus differ fundamentally from the present invention. In particular, only a single received electromagnetic signal is processed at any given time (albeit, possibly containing images of multiple targets). Moreover, Hinnrichs et al makes not provision for the spatial division of one of the two received electromagnetic signals into spatially defined partial images, as recited in the claims of the present application. Moreover, Hinnrichs et al also does not teach or suggest the displacement of spatially defined images to the edge areas of the detector array, so that two signals which are projected onto the detector array at the same time do not overlap or interfere with each other.

In regard to the latter proposition, the Office Action at page 3 notes that Hinnrichs et al includes at least one “radiation image splitter”, referring in particular to element 31B, as shown in Figure 3b. However, as is apparent from Figure 3b, as well as from the discussion of it in the specification at Column 7, lines 53 *et seq.*, the four elements 30a-d are different diffractive optical elements or “lenslets”, which divide the incoming light into four different frequency bands, which are focused separately onto the detector array 32. Accordingly, the images thus formed do correspond to the partial images according to the present invention, each of which contains “a different spatial area of said radiation image”. Moreover, there is no provision for concurrently projecting a second signal onto the detector array, as provided in the present application, or for avoiding interference between the two signals by projecting the second signal onto a different portion of the detector than is used to detect the spatially defined partial areas, which have been moved to the edge regions of the detector.

Accordingly, Applicants respectfully submit that all claims of record in this application distinguish over the cited Hinnrichs et al reference.

In light of the foregoing remark, this application should be in condition for allowance, and early passage of this case to issue is respectfully requested. If there are any questions regarding this amendment or the application in general, a telephone call to the undersigned would be appreciated since this should expedite the prosecution of the application for all concerned.

If necessary to effect a timely response, this paper should be considered as a petition for an Extension of Time sufficient to effect a timely response, and please charge any deficiency in fees or credit any overpayments to Deposit Account No. 05-1323, Docket No. 010405.56864US.

Respectfully submitted,



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